

PRELIMINARY DATA SUMMARY

April 1986

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

PRELIMINARY DATA SUMMARY

CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Field Research Facility Measurement and Analysis Work Unit at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility in Duck, North Carolina. The data were collected and the analyses performed by the FRF staff. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

CONTENTS

	Page
COVER	1
TITLE PAGE	2
TABLE OF CONTENTS.	6
I INTRODUCTION	1
II METEOROLOGICAL DATA.	2
III WAVE DATA.	6
IV CURRENT DATA	9
V SUPPLEMENTAL OBSERVATIONS.	14
VI WATER LEVELS	20
VII NEARSHORE PROFILES AND BATHYMETRY.	22
VIII SPECIAL EVENTS	25
	28

FIGURES

1 LOCATION MAP	3
2 INSTRUMENT LOCATIONS	5
3 TIME HISTORY OF WAVE HEIGHTS AND PERIODS	12
4 WATER LEVEL TIME HISTORY	23
5 CRAB PROFILES.	25
6 CRAB PROFILE ENVELOPE.	26
7 FRF CONTOUR DIAGRAM.	27

TABLES

1 INSTRUMENT STATUS/DATA AVAILABILITY.	4
2 METEOROLOGICAL DATA.	7
3 WAVE DATA.	10
4 CURRENT DATA	15
5 SUPPLEMENTAL OBSERVATIONS.	21
6 TIDAL CHARACTERISTICS.	24

I. INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Fig.1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The FRF consists of a 561-m (1,840 ft) long concrete research pier supported on 0.91 m (3 ft) diameter steel piles. The pier deck is 6.1 m (20 ft) wide, 7.74 m (25.4 ft) above mean sea level (MSL), and extends from behind the dunes to approximately the 7.6 m (25 ft) depth contour. In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Most of the data are daily observations or the results of preliminary data analysis. In many instances, continuous analog records and more extensive analyses will be made available later by the CERC Coastal Engineering Information and Analysis Center (CEIAC).

Table 1 is a list of instruments used, their status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depth at the wave gages and current meters vary and may best be determined from the information contained in Figure 8. Other installation information is contained in Table 1. All times unless otherwise specified are referenced to Eastern Standard Time (EST).

Section II presents the meteorological data; Sections III through VI, oceanographic data; Section VII, nearshore profiles and bathymetry; and Section VIII, if included, documents special events that occurred at the FRF during the month.

Questions and/or comments concerning the data may be directed to Mr. Herman C. Miller at (919) 261-3511.

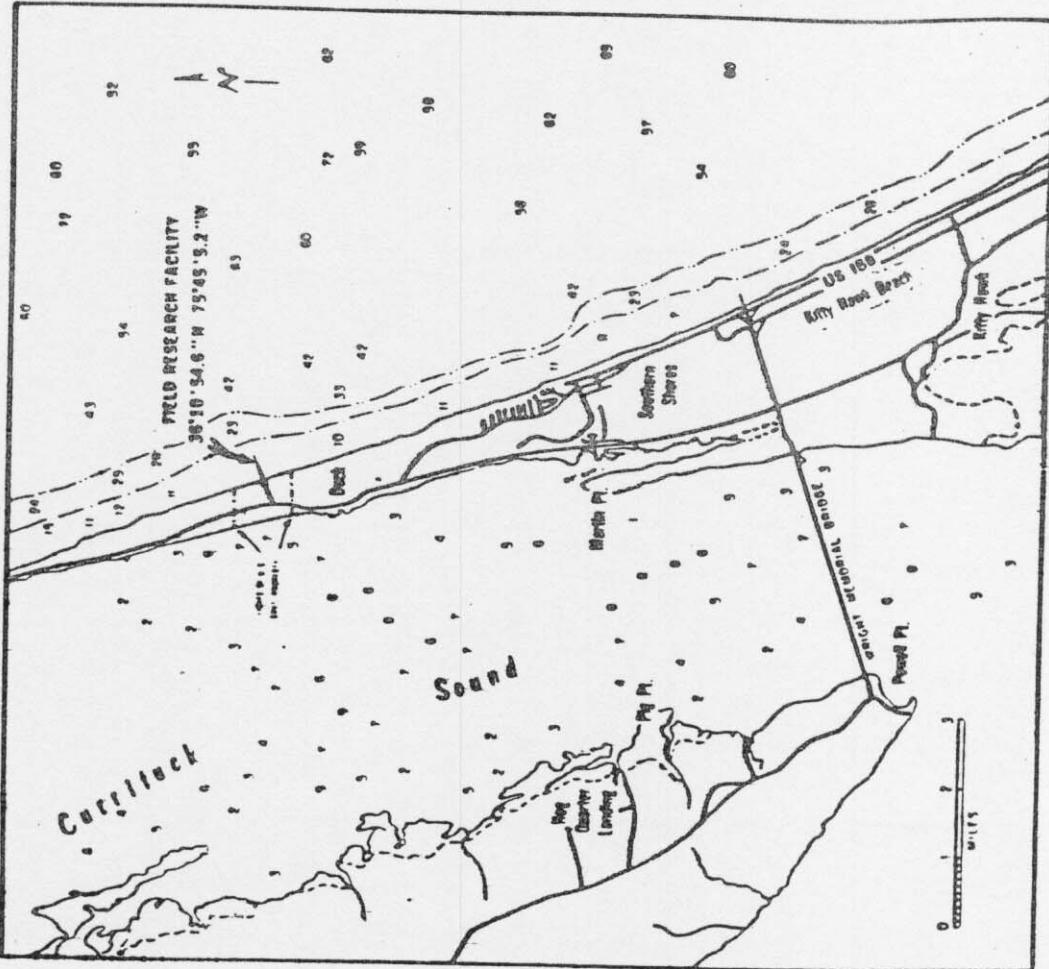
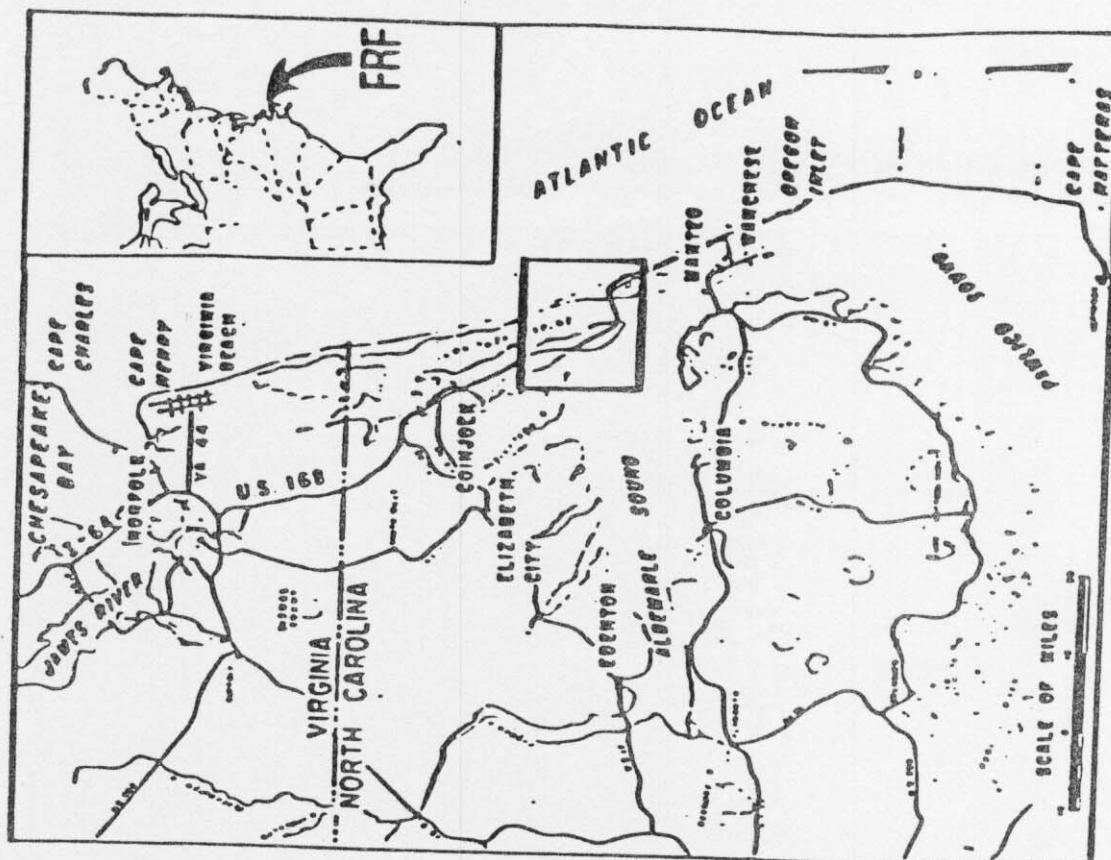


Figure 1. FRF Location Map

TABLE 1
Instrument Status/Data Availability
April 1986

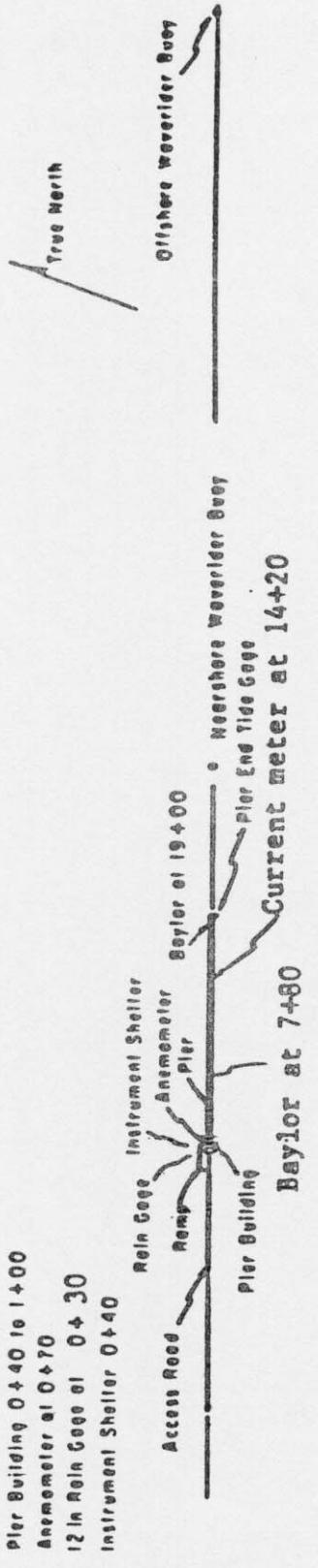
CAGE NUMBER	DESCRIPTION/REMARKS	DEPTH AT SENSOR	DAY OF THE MONTH											
			1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/			Instrument Status			Data Collected			Analog Record		
			Instrument Status	Data Collected	Analog Record	Instrument Status	Data Collected	Analog Record	Instrument Status	Data Collected	Analog Record	Instrument Status	Data Collected	Analog Record
	Barometric Pressure													
	Precipitation													
	Air Temperature													
	Anemometer on Lab Bldg - Elevation 19a (MSL)													
643	Baylor staff located at station 1480 on FRP pier	Sea profile	Operational	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
625	Baylor staff located at station 19400 on FRP pier	Sea profile	Operational	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
640	Waverider buoy located 1.0 km from shore	Approx. 6.5 m. HSL	Operational	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
620	Waverider buoy located 6.0 Km from shore	Approx. 18 m. HSL	Operational	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
639	Current meter at station 14+20 on FRP pier	Sea profile	Operational	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
679	Current meter 500M south (0.5m offshore)	Approx. 6 m HSL	Operational	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
863-6370	NOAA primary tide station located at seaward end of FRP pier.		Operational	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Instrument Status: Operational: - Daily Observation: YES

Data Collected: ALL , SOME

Analog Record: ALL , PARTIAL

Preliminary Analysis: ALL , SOME



e-Current meter 500m south of pier

CURRI TUCK SOUND

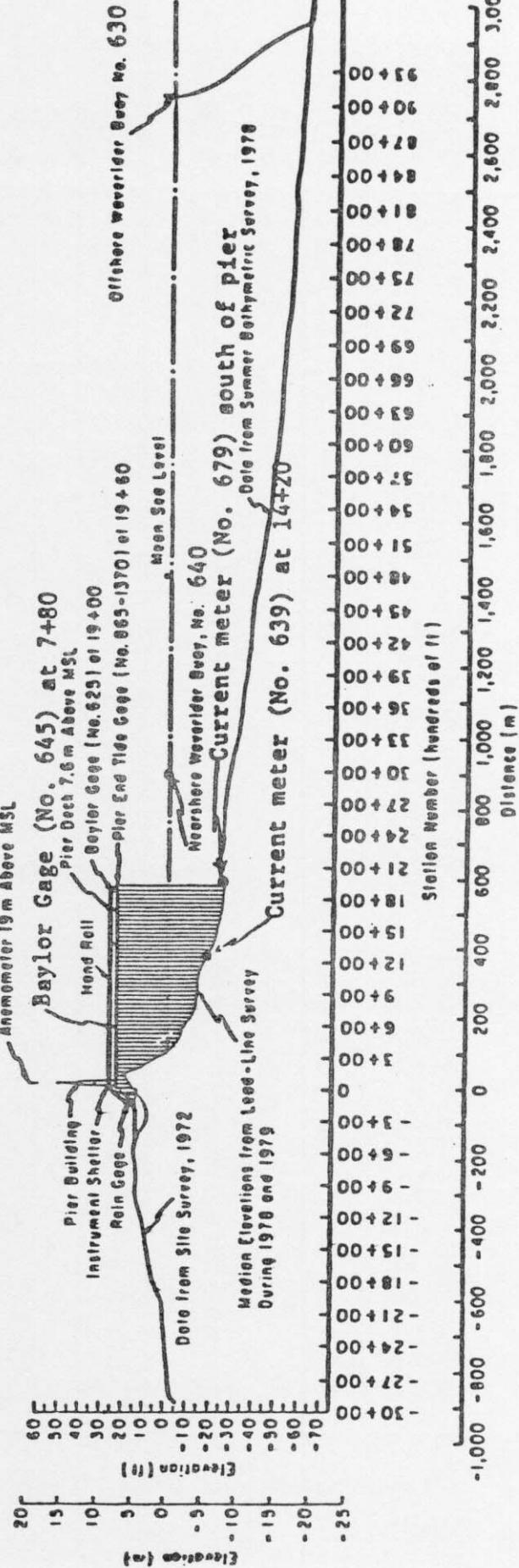


Figure 2. Instrument locations at FRF.

II. METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Fig. 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Data General NOVA-4 computer. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

The wind measurements are obtained from a Weather Measure Skyvane located on the FRF laboratory building (Fig. 2), 19.1 m above mean sea level (MSL).

The high and low temperatures are obtained from daily readings of NWS maximum and minimum thermometers and represent the extreme temperature values since the last reading.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in) -
 $mm \times .03937 = in$
2. Millibars (mb) to inches of mercury (in Hg) -
 $mb \times 0.02953 = in Hg$
3. Degrees Celcius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

TABLE 2: METEOROLOGICAL DATA

APRIL 1986

PART 1

DAY	HOUR	WIND SPEED (M/S)	WIND DIRECTION (DEG TN)	TEMPERATURE (DEG C)	ATM PRESSURE (MB)	PRECIPITATION (MM)
1	100	0	217	12.0	1021.9	0
	700	0		11.0	1022.2	0
	1300	0		15.9	1020.9	0
	1900	0		13.4	1017.8	0
2	100	3	217	16.6	1015.8	0
	700	0		16.6	1014.8	0
	1300	0		18.7	1014.4	0
	1900	2		13.2	1015.1	0
3	100	5	51	13.2	1018.2	0
	700	6	26	13.1	1020.5	0
	1300	8	45	13.4	1023.9	0
	1900	5	49	12.7	1024.9	0
4	100	5	66	12.2	1024.3	0
	700	0	153	13.3	1025.3	0
	1300	4		18.8	1024.6	0
	1900	4		20.0	1022.6	0
5	100	5	228	18.0	1022.2	0
	700	6	244	17.6	1022.6	0
	1300	7	16	13.7	1024.3	0
	1900	6	38	13.0	1023.6	0
6	100	2	356	13.8	1022.2	0
	700	3	315	14.2	1022.6	0
	1300	0	99	16.7	1020.9	0
	1900	4		12.4	1017.8	0
7	100	5	189	16.4	1016.1	0
	700	7	244	17.8	1014.1	0
	1300	2	254	22.7	1012.1	0
	1900	5	111	13.1	1012.3	0
8	100	5	149	13.5	1010.1	0
	700	2	235	17.3	1008.0	0
	1300	4	235	24.4	1002.8	0
	1900	4	265	18.0	1000.3	0
9	100	8	44	11.9	1000.9	0
	700	7	19	10.5	1002.4	0
	1300	10	29	9.6	1001.6	0
	1900	5	306	10.9	1004.1	0
10	100	10	282	8.4	1005.6	0
	700	8	295	7.6	1005.6	0
	1300	6	286	10.1	1005.4	0
	1900	2	271	10.8	1005.2	0
11	100	3	253	8.7	1006.7	0
	700	6	208	11.1	1005.5	0
	1300	9	237	17.4	1003.5	0
	1900	0	271	11.1	1004.4	0
12	100	3		12.6	1006.4	0
	700	0		12.2	1008.5	0
	1300	1	117	19.8	1009.8	0
	1900	6	77	12.4	1010.7	0
13	100	3	129	12.7	1011.7	0
	700	4	140	14.0	1012.2	0
	1300	4	143	17.7	1012.6	0
	1900	0	11	13.5	1012.6	0
14	100	6		11.3	1015.0	0
	700	8		10.8	1017.2	0
	1300	8		13.0	1019.0	0
	1900	6	35	9.6	1018.3	0
15	100	3	24	10.3	1017.7	0
	700	3	100	11.6	1017.1	0
	1300	6	137	16.1	1013.9	0
	1900	6	186	19.5	1010.4	0
16	100	6	195	18.3	1007.7	0
	700	3	878	15.6	1005.4	0
	1300	7	2	13.2	1004.2	0
	1900	7	309	13.4	1006.1	0

TABLE 2: METEOROLOGICAL DATA

PART 2

APRIL 1986

	WIND SPEED	WIND DIRECTION (DEG TN)	TEMPERATURE (DEG C)	ATM PRESSURE (MB)	PRECIPITATION (MM)
DAY	HOUR (M/S)				
17	100	7	294	9.6	1007.4
	700	6	291	7.3	1007.3
	1300	4	278	9.6	1008.1
	1900	4	325	8.9	1009.7
18	100	7	351	8.8	1010.7
	700	9	347	10.0	1012.5
	1300	17	11	9.9	1016.9
	1900	13	26	10.4	1020.1
19	100	11	19	9.6	1021.9
	700	10	10	10.5	1023.1
	1300	9	22	13.1	1023.0
	1900	6	57	10.7	1020.8
20	100	3	96	11.2	1018.6
	700	1	135	12.8	1018.4
	1300	6	153	16.1	1014.8
	1900	6	189	18.7	1011.7
21	100	5	209	17.3	1009.3
	700	6	197	18.3	1006.8
	1300	8	212	19.5	1003.4
	1900	3	223	16.7	1003.0
22	100	3	12	12.6	1005.7
	700	4	144	12.5	1005.9
	1300	8	2	13.3	1006.5
	1900	7	343	10.7	1010.6
23	100	6	341	7.7	1013.6
	700	8	337	6.6	1015.5
	1300	8	304	8.6	1016.7
	1900	8	337	9.6	1017.6
24	100	4	336	7.8	1018.6
	700	7	329	9.0	1019.7
	1300	7	13	14.3	1020.5
	1900	0		12.8	1016.6
25	100	5	296	13.1	1015.6
	700	5	334	15.0	1015.5
	1300	5	7	17.5	1015.6
	1900	3	95	13.2	1015.7
26	100	2	253	13.2	1015.7
	700	3	293	14.4	1016.2
	1300	0		19.1	1014.5
	1900	3	114	16.7	1015.2
27	100	2	86	13.0	1016.1
	700	5	30	13.0	1017.1
	1300	3	115	17.5	1017.5
	1900	3	137	15.2	1016.1
28	100	0		13.7	1017.4
	700	0		14.2	1017.4
	1300	0		18.5	1017.8
	1900	0		15.2	1015.9
29	100	5	124	14.3	1014.8
	700	3	119	15.0	1013.3
	1300	7	187	15.6	1013.2
	1900	6	59	13.6	1015.3
30	100	2	284	13.6	1016.2
	700	6	349	17.0	1018.8
	1300	3	36	17.6	1019.8
	1900	3	126	15.8	1017.5

III. WAVE DATA

Wave data were collected from two Baylor staff gages (CERC gage Nos. 625 and 645) and Waverider buoys (CERC gage Nos. 630 and 640, Table 1 and Figure 2). The data were collected, analyzed, and stored on magnetic tape using a Data General NOVA-4 computer.

The NOVA-4 is programmed to sample the wave gages every 6 hours near 0100, 0700, 1300, and 1900 EST at a sampling rate of four times per second, collecting data in 20-minute records.

Wave height (H_{mo}) is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. The wave period is identified from the computation of a variance (energy) spectrum using a Fast Fourier Transform of 4096 data points (1024 sec). The period (T_p) is that associated with the maximum energy density in the spectrum. When this analysis is complete, the data are written to magnetic tape and entered into the CERC data base.

Table 3 presents the wave heights and periods for each wave record obtained during the month. The monthly means shown in Table 3 are an average of the values computed for all data records collected. The monthly standard deviations are standard deviations from the monthly mean of values for each record.

Figure 3 is a time history of the H_{mo} and T_p values for the Waverider 6 km from shore (630) and the Baylor gage at pier station 19+00 (625).

Differences in wave periods between wave gages (Table 4 and Figure 3) may be due to wave breaking or reformation, or the presence of multiple wave trains containing nearly equal energy.

TABLE 3: WAVE DATA

PART 1

APRIL 1986

GAGE		645		625		640		630	
DAY	TIME	Baylor at 7+00 Hmo(m)	T(sec)	Baylor at 19+00 Hmo(m)	T(sec)	Nearshtr Wvrdr Hmo(m)	T(sec)	Farshtr Wvrdr Hmo(m)	T(sec)
1	1	.41	8.06	.66	8.06	.74	9.75	.82	8.83
7		.49	8.83	.74	8.83	.65	9.75	.74	10.89
13		.45	9.75	.64	8.83	.71	9.75	.78	8.06
19		.50	8.83	.64	8.83	.64	8.83	.76	8.06
2	1	.40	9.75	.64	9.75	.64	8.83	.70	8.06
7		.35	9.75	.61	8.83	.59	9.75	.67	9.75
13		*		.56	8.83	.59	9.75	.74	9.75
19		.44	9.75	.67	9.75	.64	9.75	.70	7.42
3	1	.46	9.75	.68	9.75	.67	8.83	.74	9.75
7				.73	9.75	.73	8.83	.81	9.75
13		*		.84	9.75	.83	9.75	.91	8.83
19				1.05	5.99	.98	6.87	1.15	6.40
4	1	.85	5.31	1.08	9.75	1.08	6.40	1.13	8.83
7		1.05	9.75	1.14	8.83	1.21	8.83	1.16	8.06
13		*		1.17	8.83	1.24	8.83	1.26	8.83
19		.64	9.75	.98	8.83	1.01	9.75	1.06	9.75
5	1	*		.81	8.83	.97	9.75	.94	9.75
7		.42	8.83	.67	8.83	.77	8.83	.71	8.83
13		.45	9.75	.68	8.83	.66	8.83	.78	8.83
19		.91	5.63	1.04	8.83	1.06	9.75	1.22	6.40
6	1	*		1.20	6.87	1.17	5.99	1.26	5.99
7		.85	6.40	.99	7.42	.99	6.87	1.13	7.42
13		1.03	7.42	1.15	8.06	1.23	6.87	1.27	8.83
19		.84	8.06	.93	8.06	1.09	8.83	1.19	8.83
7	1	.91	7.42	.92	8.83	.87	8.83	.97	8.83
7		.54	7.42	.80	8.83	.81	8.83	.96	9.75
13		*		.72	9.75	.78	8.83	.82	6.87
19				.89	9.75	.81	8.83	.95	7.42
8	1	.48	8.83			.79	8.83	.76	8.83
7		.37	9.75	.61	8.83	.63	9.75	.68	8.83
13		*				.55	9.75	.64	8.83
19				.45	9.75	.47	10.89	.49	8.83
9	1	.80	2.95	.71	9.75	.72	8.83	.70	9.75
7		.72	4.76	1.00	5.99	.98	4.76	1.11	6.40
13		.81	9.75	.87	5.31	.85	5.99	1.02	5.63
19		.57	4.76	.68	9.75	.76	9.75	.82	8.83
10	1	*		.64	12.34	.64	4.76	.89	3.95
7				.49	9.75	.49	10.89	.60	10.89
13		.63	9.75	.50	12.34	.45	12.34	.55	10.89
19		*		.46	14.22	.49	14.22	.53	14.22
11	1	.33	14.22	.43	14.22	.42	14.22	.44	10.89
7		.35	14.22	.54	14.22	.38	14.22	.52	14.22
13		*		.35	14.22	.30	14.22	.49	14.22
19		.30	14.22	.39	12.34	.42	12.34	.40	12.34
12	1	.25	10.89	.34	14.22	.29	14.22	.46	14.22
7		.32	14.22	.40	12.34	.40	10.89	.44	12.34
13		.27	14.22	.45	12.34	.43	12.34	.51	12.34
19		.37	12.34	.45	12.34	.46	12.34	.48	10.89
13	1	.43	2.69	.53	9.75	.47	12.34	.51	12.34
7		.57	3.79	.61	3.95	.61	4.13	.72	4.13
13		.46	3.64	.79	5.31	.79	5.63	.84	5.99
19		.55	5.02	.89	5.02	.82	5.02	.90	5.31
14	1	.89	5.31	.94	5.63	.94	4.76	1.03	5.02
7		1.00	6.40	1.28	6.87	1.37	6.87	1.47	7.42
13		.91	4.76	*		1.09	6.40	1.11	6.40
19		.79	5.63	.91	5.31	.97	5.63	1.03	5.63
15	1	.61	16.79	.72	16.79	.80	16.79	.84	4.76
7		.49	16.79	.81	6.87	.85	7.42	.84	6.40
13		.61	16.79	*		.86	8.83	.97	7.42
19		.60	16.79			.93	7.42	1.08	7.42
16	1	.75	6.40	1.01	8.83	.94	5.63	1.21	6.40
7		.62	5.99	1.02	8.83	.86	6.40	.99	6.40
13		.82	7.42	.95	8.06	.98	8.83	1.13	6.87
19		.71	5.99	.96	9.75	1.02	6.87	1.09	8.83

*=Electronic problems

TABLE 3: WAVE DATA

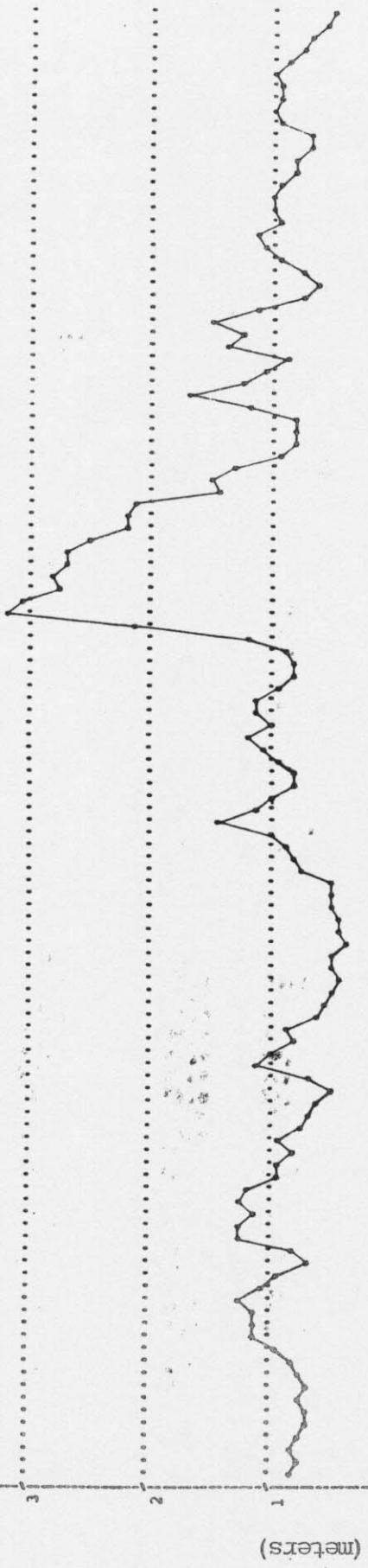
PART 2

APRIL 1986

GAGE	DAY	TIME	645		625		640		630	
			Baylor at 7+80 Hmo(m)	T(sec)	Baylor at 19+00 Hmo(m)	T(sec)	Nearshr Wvrdr Hmo(m)	T(sec)	Farshr Wvrdr Hmo(m)	T(sec)
	17	1	.56	8.06	.78	8.83	.88	8.06	.96	8.06
	7		.51	12.34	.69	12.34	.77	9.75	.82	7.42
	13		.52	12.34	.70	10.89	.84	10.89	.79	9.75
	19		.61	12.34	.81	10.89	.85	9.75	.87	10.89
18	1		.79	9.75	.99	9.75	.99	10.89	1.18	9.75
	7		1.21	6.87	1.69	7.42	1.70	6.87	2.11	5.99
	13		1.27	9.75	2.96	9.75	3.10	9.75	3.18	8.83
	19		1.18	10.89	2.59	8.83	2.71	10.89	3.04	9.75
	1		1.33	10.89	2.83	10.89	3.05	10.89	2.76	10.89
	7		1.20	16.79	2.81	14.22	2.77	14.22	2.82	12.34
	13		1.31	14.22	2.99	14.22	*		2.69	14.22
	19		1.24	14.22	2.80	14.22	3.24	14.22	2.70	14.22
20	1		1.47	16.79	*		*		2.50	14.22
	7		1.47	16.79	2.64	14.22	2.96	14.22	2.19	14.22
	13		1.47	14.22	*		2.60	14.22	2.17	14.22
	19		1.38	6.40	2.08	12.34	2.21	12.34	2.15	14.22
21	1		1.21	14.22	*		1.69	14.22	1.44	10.89
	7		.84	12.34	1.49	12.34	1.54	12.34	1.47	12.34
	13		.58	5.02	*		1.18	12.34	1.30	12.34
	19		.47	12.34	1.04	12.34	.98	12.34	.92	10.89
22	1		.44	10.89	.98	10.89	.87	9.75	.84	10.89
	7		.45	14.22	.69	9.75	.74	9.75	.81	10.89
	13		.53	14.22	.69	9.75	.71	9.75	.83	9.75
	19		.76	5.02	.91	4.32	.94	5.02	1.21	4.53
23	1		.90	5.63	.82	6.40	.78	5.63	1.67	5.63
	7		.68	5.99	.74	5.99	.71	6.87	1.25	5.63
	13		.75	5.31	.87	6.40	.79	6.40	1.08	6.40
	19		.76	5.63	.83	5.63	.86	6.40	.87	6.40
24	1		1.07	5.99	1.34	6.40	1.23	6.87	1.36	6.87
	7		.94	6.87	.99	7.42	1.10	6.87	1.27	6.87
	13		1.02	6.87	1.41	8.06	1.29	8.06	1.47	8.06
	19		.72	8.06	.93	8.06	.98	7.42	1.09	8.06
25	1		.45	5.02	.74	7.42	.76	8.83	.72	7.42
	7		.37	6.87	.58	8.06	.67	7.42	.63	9.75
	13		.63	3.51	.83	8.83	.77	9.75	.72	8.06
	19		.43	8.06	.85	8.06	.88	8.06	.96	5.31
26	1		.66	10.89	1.21	10.89	1.13	10.89	1.05	10.89
	7		.60	9.75	1.11	9.75	1.20	6.87	1.09	8.83
	13		*		.96	10.89	.90	9.75	.95	7.42
	19		.41	3.02	.89	9.75	.92	9.75	1.02	8.83
27	1		.50	9.75	.93	9.75	.95	9.75	.99	8.83
	7		.51	8.83	.84	9.75	.93	9.75	.94	9.75
	13		.36	4.32	.76	9.75	.78	9.75	.82	8.06
	19		.35	4.53	.72	8.06	.82	8.83	.83	8.83
28	1		.36	9.75	.63	8.83	.70	9.75	.69	9.75
	7		*		.71	8.06	.70	8.06	.71	8.63
	13		*		.82	7.42	.83	8.83	.97	8.83
	19		.45	8.06	.86	8.83	1.00	8.83	.99	8.83
29	1		.54	8.83	.84	8.83	.95	9.75	.92	9.75
	7		.38	8.06	.95	9.75	.88	8.06	.93	7.42
	13		.52	3.64	1.00	8.06	1.04	8.06	1.02	8.83
	19		.57	3.51	.92	8.83	.86	8.83	.89	8.83
30	1		.37	4.32	.65	8.83	.75	8.83	.73	6.40
	7		.43	2.30	.65	7.42	.63	7.42	.68	8.06
	13		.31	3.26	.50	8.06	.53	8.06	.59	8.83
	19		.22	3.79	.47	7.42	.47	7.42	.47	8.83
	MEAN		.67	8.81	.95	9.33	.97	9.22	1.06	8.95
	STD		.31	3.86	.55	2.42	.57	2.51	.55	2.46

*=Electronic problems

CERC Gage Number 630, Waverider 6 km from shore



DAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
CERC Gage Number 625, pier station 19+00

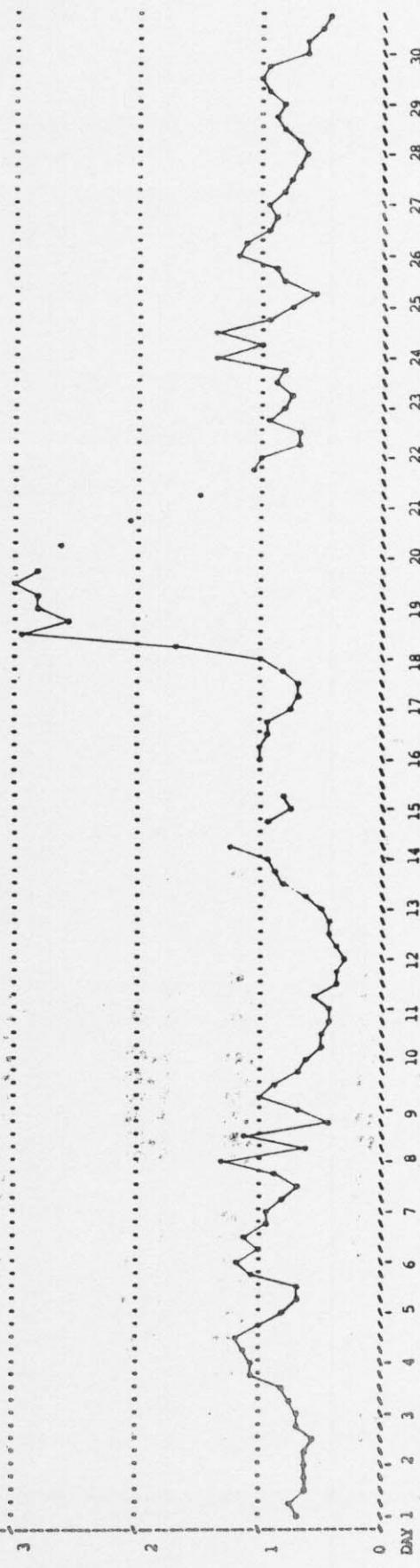


FIGURE 3. Time History of Wave Heights and Periods - April 1986

Part I: Heights

CERC Gage Number 630, Waverider 6 km from shore

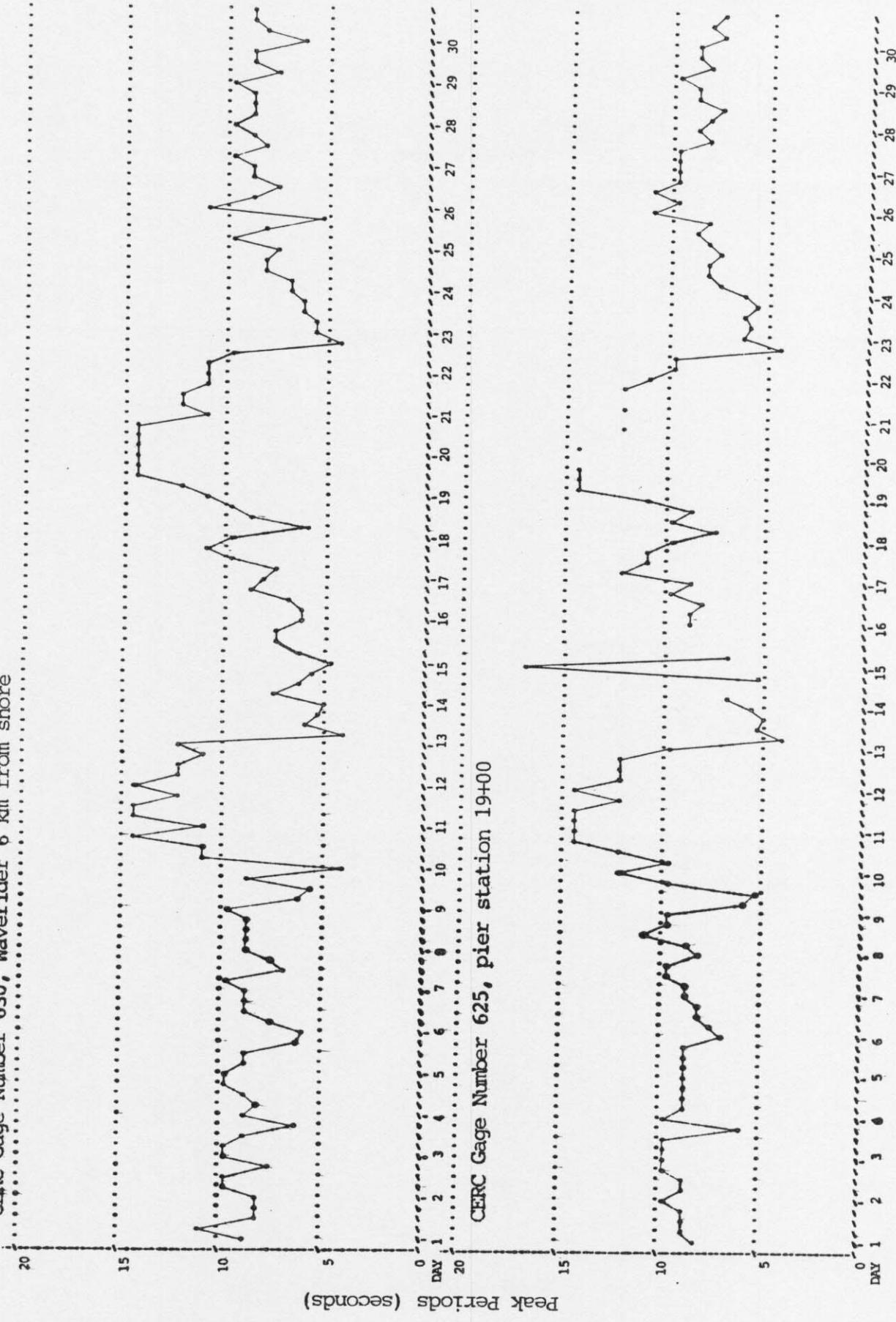


FIGURE 3. Time History of Wave Heights and Periods - April 1986

Part III: Periods

IV. CURRENT DATA

Current data (Table 4) are collected from two Marsh-McBirney electromagnetic biaxial current meters (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, alongshore currents flow either toward 340 (i.e. northward) or toward 160 (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second.

TABLE 4: CURRENT DATA
(SPEEDS IN CM/SEC)

April 1986

DAY	TIME	PIER MEASUREMENTS			BEACH MEASUREMENTS (500 UPDRIFT)			CURRENT METER		
		DYE AT	CURRENT METER	DYE AT MID-SURF ZONE	DYE	AT SOUTH TRIPOD	DIST. FROM	(SURFACE)	(SURFACE)	(DEPTH -4.8m MSL)
1	0100-Alongshore	19400	AT 14+20(433m)	I.D. 0639	DYE AT MID-SURF ZONE	DYE	12M OFFSHORE	(SURFACE)	(SURFACE)	I.D. 0679
1	Cross-shore	(579m)	(SURFACE)	(DEPTH -4.2m MSL)	(SURFACE)	(DEPTH -4.8m MSL)	DIST. FROM	(SURFACE)	(SURFACE)	I.D. 0679
1	Resultant									
1	0700-Alongshore	0	0	1	S			34	N	
1	Cross-shore	0	0	2	OF			188	0	
1	Resultant	-	-	2	22			34	3401	
1	1300-Alongshore	-	-	4	N					
1	Cross-shore	-	-	3	OF					
1	Resultant	-	-	5	17					
1	1900-Alongshore	-	-	0						
1	Cross-shore	-	-	0						
1	Resultant	-	-	0	0					
2	0100-Alongshore	-	-	10	S					
2	Cross-shore	-	-	6	ON					
2	Resultant	-	-	12	121					
2	0700-Alongshore	38	S	1	N			20	N	
2	Cross-shore	19	Off	1	ON			140	8	
2	Resultant	43	133	1	295			21	318	
2	1300-Alongshore	-	-	3	N					
2	Cross-shore	-	-	2	OF					
2	Resultant	-	-	4	14					
2	1900-Alongshore	-	-	6	S					
2	Cross-shore	-	-	1	OF					
2	Resultant	-	-	6	151					
3	0100-Alongshore	-	-	0						
3	Cross-shore	-	-	0						
3	Resultant	-	-	0	0					
3	0700-Alongshore	68	S	10	S			41	S	
3	Cross-shore	0	0	0				6	Off	
3	Resultant	68	170	10	160			41	151	
3	1300-Alongshore	-	-	12	S					
3	Cross-shore	-	-	3	OF					
3	Resultant	-	-	12	146					
3	1900-Alongshore	-	-	6	S					
3	Cross-shore	-	-	0						
3	Resultant	-	-	6	160					
4	0100-Alongshore	-	-	3	S					
4	Cross-shore	-	-	2	OF					
4	Resultant	-	-	4	126					
4	0700-Alongshore	21	S	9	S			41	N	
4	Cross-shore	2	Off	1	ON			188	41	
4	Resultant	21	154	9	166			52	25	
4	1300-Alongshore	-	-	6	S					
4	Cross-shore	-	-	3	OF					
4	Resultant	-	-	7	133					
4	1900-Alongshore	-	-	1	S					
4	Cross-shore	-	-	1	ON					
4	Resultant	-	-	1	205					
5	0100-Alongshore	-	-	2	N					
5	Cross-shore	-	-	1	OF					
5	Resultant	-	-	2	7					
5	0700-Alongshore	8	S	2	S			44	N	
5	Cross-shore	14	Off	1	OF			140	13	
5	Resultant	16	100	2	133			45	357	
5	1300-Alongshore	-	-	15	S					
5	Cross-shore	-	-	5	UF					
5	Resultant	-	-	15	152					
5	1900-Alongshore	-	-	16	S					
5	Cross-shore	-	-	1	ON					
5	Resultant	-	-	16	164					
6	0100-Alongshore	-	-	7	S					
6	Cross-shore	-	-	1	OF					
6	Resultant	-	-	7	152					
6	0700-Alongshore	41	S	17	S			76	S	
6	Cross-shore	4	Off	3	ON			176	15	
6	Resultant	41	154	17	170			78	149	
6	1300-Alongshore	-	-	14	S					
6	Cross-shore	-	-	0						
6	Resultant	-	-	14	160					
6	1900-Alongshore	-	-	12	S					
6	Cross-shore	-	-	3	ON					
6	Resultant	-	-	12	174					

KEY = ALL SPEEDS IN CM/SEC
N = NORTHWARD, SHORE PARALLEL
S = SOUTHWARD, SHORE PARALLEL
ON=ONSHORE
OF=OFFSHORE

DAY	TIME	PIER MEASUREMENTS						BEACH MEASUREMENTS (500 UPDRIFT)					
		DYE AT	CURRENT METER	AT 14+20 (433m)	DYE AT MID-SURF ZONE	DYE	CURRENT METER	AT SOUTH TRIPOD					
		(579m)	I.D. #639	(SURFACE)	12M OFFSHORE	(DEPTH -4.8m MSL)							
					DIST. FROM	(SURFACE)							
7	0100-Alongshore	19+00	1	9	5	1	22	S					
	Cross-shore			3	ON								
	Resultant		9	128									
7	0700-Alongshore	12	N	1	N								
	Cross-shore	26	Off	2	OF	140	11	S					
	Resultant	28	46	2	43		8	Off	North	5	S	7	N
							14	123				5	ON
7	1300-Alongshore			3	N							1	6
	Cross-shore			1	OF							2	OF
	Resultant			3	358							2	22
7	1900-Alongshore			3	N							3	5
	Cross-shore			3	OF							4	OF
	Resultant			4	25							5	102
8	0100-Alongshore			3	N							1	6
	Cross-shore			2	OF							1	ON
	Resultant			4	12							2	216
8	0700-Alongshore	22	N	5	N							3	N
	Cross-shore	13	Off	3	OF	140	14	N		6	N	0	
	Resultant	25	11	6	14		5	Off	South			3	
8	1300-Alongshore			11	N							9	N
	Cross-shore			6	OF							2	OF
	Resultant			13	11							9	353
8	1900-Alongshore			14	N							2	N
	Cross-shore			3	OF							3	OF
	Resultant			14	354							3	34
9	0100-Alongshore			5	6							19	5
	Cross-shore			0								5	OF
	Resultant			5	160							20	145
9	0700-Alongshore	18	S	1	S							12	6
	Cross-shore	4	Off	0		140	34	S		22	S	11	OF
	Resultant	12	146	1	160		14	Off	North			12	116
9	1300-Alongshore			9	N							13	6
	Cross-shore			1	OF							5	OF
	Resultant			9	342							14	138
9	1900-Alongshore			1	N							21	S
	Cross-shore			2	ON							3	OF
	Resultant			3	269							22	153
10	0100-Alongshore			1	N							12	S
	Cross-shore			0								1	OF
	Resultant			1	340							12	152
10	0700-Alongshore	30	S	7	N							8	S
	Cross-shore	5	Off	0		128	34	S		22	S	0	
	Resultant	31	151	7	340		10	Off	North			8	160
10	1300-Alongshore			5	S							15	5
	Cross-shore			2	OF							7	OF
	Resultant			5	142							12	135
10	1900-Alongshore			9	N							14	6
	Cross-shore			1	OF							8	OF
	Resultant			9	348							16	122
11	0100-Alongshore			15	N							6	S
	Cross-shore			2	OF							3	OF
	Resultant			15	347							3	
11	0700-Alongshore	30	N	19	N							6	133
	Cross-shore	15	Off	5	OF	128	18	N		5	N	10	N
	Resultant	34	7	20	354		7	Off	South			1	OF
11	1300-Alongshore			6	N							5	N
	Cross-shore			3	OF							2	ON
	Resultant			7	5							6	309
11	1900-Alongshore			11	N							1	N
	Cross-shore			3	OF							1	OF
	Resultant			11	356							2	34
12	0100-Alongshore			3	N							8	S
	Cross-shore			1	OF							7	OF
	Resultant			3	7							11	120
12	0700-Alongshore	17	N	18	N							12	N
	Cross-shore	7	Off	8	OF	128	0	0		6	N	5	OF
	Resultant	18	2	20	5		0	0	South			13	4
12	1300-Alongshore			16	N							6	N
	Cross-shore			4	OF							6	OF
	Resultant			17	353							8	23
12	1900-Alongshore			12	N							1	S
	Cross-shore			1	OF							5	OF
	Resultant			12	343							5	22

KEY = ALL SPEEDS IN CM/SEC
 N =NORTHWARD, SHORE PARALLEL
 S=SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

DAY:	TIME	PIER MEASUREMENTS			BEACH MEASUREMENTS			CURRENT METER AT SOUTH TRIFOD (DEPTH -4.8m MSL)
		DYE AT 19400 (579m) (SURFACE)	CURRENT METER AT 14+20(433m) I.D. #639 (DEPTH -4.2m MSL)	DYE AT MID-SURF ZONE (SURFACE)	DIST. FROM BASELINE(M)	DYE 12M OFFSHORE (SURFACE)		
13	0100-Alongshore	15	N					11 N
	Cross-shore	4	OF					
	Resultant	16	356					4 OF
13	0700-Alongshore	12	N	5	N	0	0	12 1
	Cross-shore	2 Off		3	OF	140	2 Off	South 9 N 2 N
	Resultant	12	351	6	10	2	70	1 OF
13	1300-Alongshore	13	N					2 17
	Cross-shore	2	OF					4 6
	Resultant	13	342					7 OF
13	1900-Alongshore	13	N					8 22
	Cross-shore	4	OF					9 N
	Resultant	13	356					5 OF
14	0100-Alongshore	13		6				10 7
	Cross-shore	0		6				23 6
	Resultant	6		160				6 OF
14	0700-Alongshore	76	S	6	S	68	S	23 145
	Cross-shore	11 On		1	ON	182	24 On	North 61 S 22 S
	Resultant	77	169	8	166	72	179	5 OF
14	1300-Alongshore	11	S					22 147
	Cross-shore	1		1	ON			25 6
	Resultant	11	164					6 OF
14	1900-Alongshore	10	S					25 146
	Cross-shore	0						16 6
	Resultant	10	160					7 OF
15	0100-Alongshore	9	S					18 122
	Cross-shore	2	ON					6 S
	Resultant	9	121					8 OF
15	0700-Alongshore	9	S	6	S	0	0	11 115
	Cross-shore	6 On		1	OF	179	18 Off	North 43 N 7 S
	Resultant	11	191	6	142	18	340	5 OF
15	1300-Alongshore	1	S					9 126
	Cross-shore	1		1	OF			13 S
	Resultant	2	30					4 OF
15	1900-Alongshore	2	N					14 144
	Cross-shore	2		2	OF			2 N
	Resultant	3	33					1 ON
16	0100-Alongshore	6	N					2 300
	Cross-shore	3	OF					9 H
	Resultant	7	11					1 OF
16	0700-Alongshore	25	N	2	N	55	N	10 342
	Cross-shore	6 Off		1	OF	176	11 Off	South 42 N 5 N
	Resultant	26	354	3	9	52	351	1 OF
16	1300-Alongshore	5	S					6 352
	Cross-shore	0						9 S
	Resultant	5	160					5 OF
16	1900-Alongshore	12	S					10 132
	Cross-shore	2		2	ON			19 6
	Resultant	12	168					9 OF
17	0100-Alongshore	4	S					21 134
	Cross-shore	2	DN					8 S
	Resultant	4	183					1 ON
17	0700-Alongshore	18	S	0		47	S	8 168
	Cross-shore	4 Off		1	ON	161	16 Off	North 33 S 2 N
	Resultant	19	142	1	250	50	141	4 OF
17	1300-Alongshore	7	S					4 40
	Cross-shore	3		3	ON			14 6
	Resultant	8	186					3 OF
17	1900-Alongshore	17	S					15 138
	Cross-shore	2		2	ON			42 6
	Resultant	17	166					4 OF
18	0100-Alongshore	18	S					42 154
	Cross-shore	6		6	ON			41 5
	Resultant	19	172					6 OF
18	0700-Alongshore	76	S	26	S	102	S	1 152
	Cross-shore	11 On		8	ON	213	20 On	North 78 S 43 S
	Resultant	77	169	27	126	104	171	5 OF
18	1300-Alongshore	75	S					43 153
	Cross-shore	19		19	ON			79 6
	Resultant	77	124					10 OF
18	1900-Alongshore	69	S					80 153
	Cross-shore	18		18	ON			76 6
	Resultant	71	125					10 OF
								76 153

KEY = ALL SPEEDS IN CM/SEC
 N = NORTHWARD, SHORE PARALLEL
 S = SOUTHWARD, SHORE PARALLEL
 DN=ONSHORE
 OF=OFFSHORE

DAY	TIME	PIER MEASUREMENTS						BEACH MEASUREMENTS					
		DYE AT	CURRENT METER	AT 14+20(433m)	DYE AT MID-SURF ZONE	(SURFACE)	DIST. FROM	(SURFACE)	CURRENT METER	AT SOUTH TRIPOD	12M OFFSHORE	(DEPTH -4.8m MSL)	I.D. #679
19	0100-Alongshore												
	Cross-shore			42	S								
	Resultant			7	ON								
19	0700-Alongshore	47	S	36	S								
	Cross-shore	5	On	2	ON	349	68	S					
	Resultant	47	166	36	164		87	192					
19	1300-Alongshore			19	S								
	Cross-shore			2	ON								
	Resultant			19	166								
19	1900-Alongshore			19	S								
	Cross-shore			6	OF								
	Resultant			20	143								
20	0100-Alongshore			7	S								
	Cross-shore			31	OF								
	Resultant			32	83								
20	0700-Alongshore	20	S	12	S								
	Cross-shore	15	Off	23	OF	365	44	N					
	Resultant	25	123	25	98		33	Off					
20	1300-Alongshore			1	S								
	Cross-shore			2	OF								
	Resultant			3	93								
20	1900-Alongshore			0									
	Cross-shore			1	ON								
	Resultant			1	250								
21	0100-Alongshore			3	N								
	Cross-shore			2	OF								
	Resultant			4	7								
21	0700-Alongshore	8	N	5	N								
	Cross-shore	17	Off	6	OF	216	51	N					
	Resultant	19	44	8	28		36	Off					
21	1300-Alongshore			5	N								
	Cross-shore			3	OF								
	Resultant			6	10								
21	1900-Alongshore			4	N								
	Cross-shore			3	OF								
	Resultant			5	18								
22	0100-Alongshore			3	N								
	Cross-shore			2	OF								
	Resultant			4	13								
22	0700-Alongshore	21	N	3	N								
	Cross-shore	9	Off	3	OF	152	34	N					
	Resultant	23	4	4	32		14	Off					
22	1300-Alongshore			1	N								
	Cross-shore			3	OF								
	Resultant			3	50								
22	1900-Alongshore			16	S								
	Cross-shore			4	ON								
	Resultant			16	173								
23	0100-Alongshore			17	S								
	Cross-shore			5	ON								
	Resultant			18	176								
23	0700-Alongshore	47	S	14	S								
	Cross-shore	14	Off	4	ON	161	27	1					
	Resultant	49	143	14	178		4	Off					
23	1300-Alongshore			5	S								
	Cross-shore			2	ON								
	Resultant			6	187								
23	1900-Alongshore			16	S								
	Cross-shore			5	ON								
	Resultant			17	177								
24	0100-Alongshore			10	S								
	Cross-shore			2	-	ON							
	Resultant			10	171								
24	0700-Alongshore	68	S	12	S								
	Cross-shore	0	0	2	ON	176	87	S					
	Resultant	68	170	12	171		0	0					
24	1300-Alongshore			12	S								
	Cross-shore			1	ON								
	Resultant			12	162								
24	1900-Alongshore			9	S								
	Cross-shore			4	ON								
	Resultant			10	184								

KEY = ALL SPEEDS IN CM/SEC
 N = NORTHWARD, SHORE PARALLEL
 S = SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

DAY	TIME	PIEZ-MEASUREMENTS			BEACH MEASUREMENTS (500' UPDRIFT)							
		DYE AT	CURRENT METER		DYE AT MID-SURF ZONE		CURRENT METER					
		19+00 (579m)	AT 14+20 (433m) I.D. 6639	(SURFACE)	(SURFACE)	12M OFFSHORE (SURFACE)	AT SOUTH TRIPOD (DEPTH -4.6m MSL) I.D. 6679					
DAY	TIME	SPEED	DIREC	SPEED	PB	BASELINE (H)	SPEED	LOCATION	SPEED	DIREC	SPEED	DIREC
25	0100-Alongshore	5	S	6	PB	BASELINE (H)	SPEED	LOCATION	SPEED	DIREC	SPEED	DIREC
	Cross-shore	2	ON								6	OF
	Resultant	6	185								14	135
25	0700-Alongshore	36	S	6	6						15	6
	Cross-shore	0	0	0		116	27 S	North	25 S	4	OF	
	Resultant	36	120	6	160		27	166			16	145
	Cross-shore			6							15	6
	Resultant			1	OF						6	OF
25	1300-Alongshore	36	120	6	160						16	139
	Cross-shore			6							3	S
	Resultant			1	OF						1	ON
25	1900-Alongshore	0		0							3	182
	Cross-shore			1	OF						10	6
	Resultant			1	70						3	OF
26	0100-Alongshore	2	S	6							11	142
	Cross-shore	0	On	1	ON						6	5
	Resultant	65	179	2	184	172	32 1	North	5 S	4	OF	
26	0700-Alongshore	61	S	2	6						7	126
	Cross-shore	22	On	1	ON						20	6
	Resultant			1	OF						4	OF
26	1300-Alongshore	65	179	2	184		32	340			21	148
	Cross-shore			9	6						4	S
	Resultant			9	155						3	OF
26	1900-Alongshore	0		0							5	122
	Cross-shore			0	OF						30	5
	Resultant			0	0						3	OF
27	0100-Alongshore	4	S	5							30	155
	Cross-shore	0	0	0							10	6
	Resultant			4	160						3	OF
27	0700-Alongshore	15	S	1	6						11	143
	Cross-shore	5	Off	1	OF	143	21 S	North	33 S	3	OF	
	Resultant	16	143	2	107		2	On			14	6
27	1300-Alongshore	3	S	5							5	OF
	Cross-shore	1	OF								4	
27	1900-Alongshore	3	S	145							15	142
	Cross-shore	1	OF								5	N
	Resultant			1	OF						4	OF
28	0100-Alongshore	1	S	70							7	21
	Cross-shore			1	OF						4	S
	Resultant			3	132						5	OF
28	0700-Alongshore	6	N	1	S						6	108
	Cross-shore	2	On	1	OF	159	6 S	North	16 S	4	OF	
	Resultant	5	318	2	116		2	Off			4	Z0
28	1300-Alongshore	2	S	6							10	6
	Cross-shore	0	0	0							7	OF
	Resultant			2	160						12	125
28	1900-Alongshore	2	S	6							2	6
	Cross-shore	0	0	0							4	OF
	Resultant			2	340						5	96
29	0100-Alongshore	0	0	1	70						5	OF
	Cross-shore			0	OF						3	
	Resultant			1	70						6	34
29	0700-Alongshore	0	0	2	S						7	
	Cross-shore	1	On	1	OF	175	20 S	North	15 S	6	OF	
	Resultant	1	250	2	125		0	0			15	5
29	1300-Alongshore	4	S	5							5	OF
	Cross-shore	0	0	0							16	
	Resultant			4	160						13	S
29	1900-Alongshore	5	S	5							6	OF
	Cross-shore	1	ON	1	OF						14	
	Resultant			5	171						3	S
30	0100-Alongshore	1	S	2	OF						5	OF
	Cross-shore	2	On	0							6	
	Resultant			2	85						6	43
30	0700-Alongshore	47	S	7	S						28	S
	Cross-shore	2	On	0		155	1 Off	North	32 S	6	OF	
	Resultant	47	153	2	160		28	157			6	89
30	1300-Alongshore	5	S	5							17	S
	Cross-shore	1	OF								4	OF
	Resultant			5	151						17	145
30	1900-Alongshore	1	N	1							5	S
	Cross-shore	2	OF								3	OF
	Resultant			2	54						6	133

KEY = ALL SPEEDS IN CM/SEC
 N = NORTHWARD, SHORE PARALLEL
 S = SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

V. SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) taken at the seaward end of the pier are made of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves) but not surface chop or capillary waves. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring alignment of the wave crests. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 east of true north; consequently, wave angles greater than 70 imply the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are made daily at the seaward end of the FRF pier. A jar along with a thermometer is lowered about .3 m (1 ft) into the water and allowed to remain for at least one minute. The jar is removed, the temperature read and a hydrometer is used to determine the density. A secci disc is used to determine the surface visibility.

Table 5

SUPPLEMENTAL OBSERVATIONS

April 1986

DAY/TIME	WAVE APPROACH ANGLE AT PIER END (° from True N)		RADAR WAVE ANGLE (° from True N)	WIDTH OF SURF ZONE(M)	WATER CHARACTERISTICS AT PIER END		
	PRIMARY	SECONDARY			DENSITY (g/cc)	SECCI	VIS(M)
1 0600	95			109	10.5	1.0238	2.4
2 0845	100	40		30	12.3		2.4
3 0800	70	45		87	12.5		2.1
4 0800	80	40		121	12.6	*	1.5
5 0745	90			18	10.5		2.4
6 0915	60	30		119	12.7		1.8
7 0810	50	80		12	12.0		4.6
8 0800	85			9	10.5		3.6
9 0935	70	40		45	10.8	1.0224	4.0
10 0710	40		60	6	10.2	1.0230	1.8
11 0820	80	140		6	11.0	1.0214	2.4
12 0800	80	40		0	11.2	1.0232	4.6
13 0820	50			24	11.2	1.0236	4.3
14 0825	30		50	138	12.1	1.0223	2.7
15 0730	95	45		116	12.5	1.0204	2.7
16 0735	100			109	10.1	1.0241	1.5
17 0735	85			91	10.5	1.0238	2.7
18 0735	40			213	11.2	1.0204	1.5
19 0920	70		60	805	11.0	1.0208	.3
20 0900	70		70	800	11.4	1.0214	.3
21 0805	60	125	80	213	10.3	1.0241	.3
22 0815	100			82	10.5	1.0246	.9
23 0810	25		40	84	12.1	1.0198	.9
24 0810	35		50	135	11.7	1.0202	.9
25 0715			60	6	11.6	1.0200	1.2
26 0840	50			131	12.7	1.0198	1.8
27 0845	65		75	71	12.5	1.0201	1.5
28 0700	25	125		91	13.9	1.0208	2.4
29 0705	30		70	125	14.0	1.0212	1.8
30 0635	100		50	71	15.6	1.0200	2.1

*=Hydrometer broken

VI. WATER LEVELS

The National Ocean Services (NOS) has established a primary tide station (No. 865- 1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect data every 6 minutes throughout the month.

Figure 4 shows the variation in mean water levels computed over a tidal cycle period (12.42 hours), and contains a list of selected mean and extreme values. This presentation is useful in identifying effects on both meteorological and astronomical forces on the open coast water levels.

Table 6 contains the time of the center of each sampling interval and the range, high, low, and mean water levels during each tidal cycle.

FRF TIDE HEIGHTS

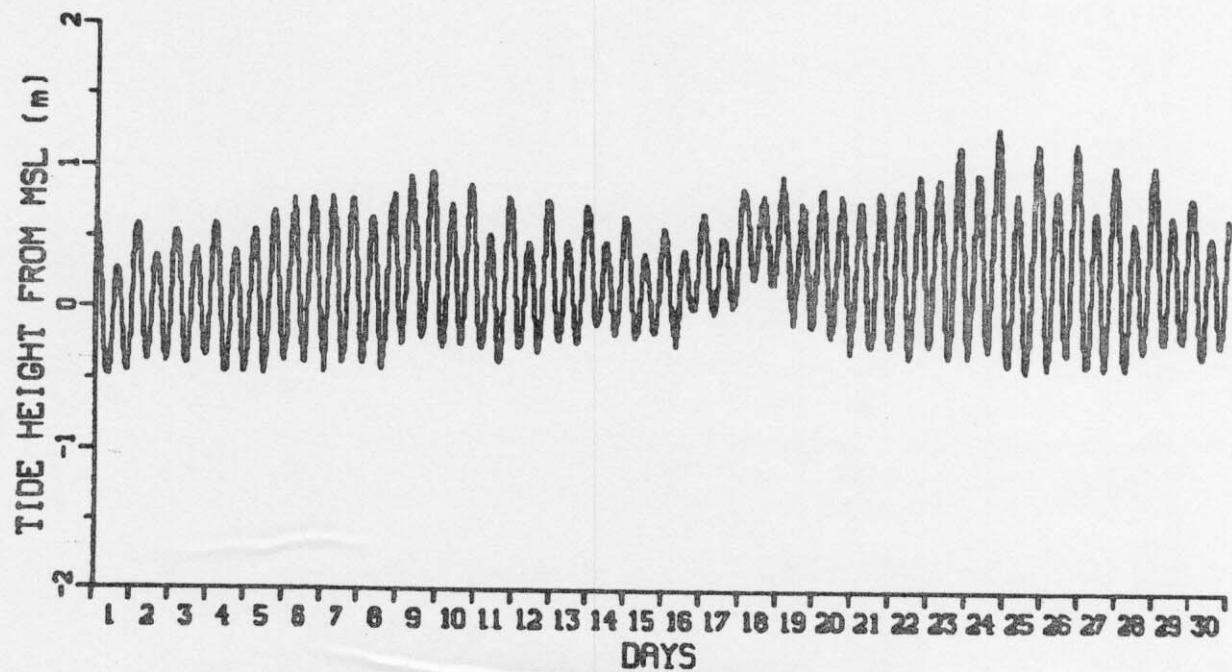


FIGURE 4. Time History of Mean Water Levels, April 1986 (Gage No. 865-1370)

MONTHLY MEAN WATER LEVELS (METERS MSL)

Extreme Low -	-.48 on 1 April at 0724 hrs.
Extreme High -	1.30 on 24 April at 1924 hrs.
Monthly Mean -	.24
Mean Low Water -	-.27
Mean High Water -	.82
Mean Range -	1.10

MID-CYCLE DAY	TIME	LOW	HIGH	MEAN	RANGE
1	612	-0.48	0.59	-0.01	1.07
1	1837	-0.45	0.57	-0.02	1.01
2	703	-0.36	0.58	0.07	0.94
2	1928	-0.37	0.50	0.04	0.87
3	753	-0.39	0.54	0.06	0.93
3	2018	-0.33	0.55	0.09	0.88
4	843	-0.44	0.60	0.04	1.04
4	2109	-0.44	0.45	0.01	0.89
5	934	-0.45	0.55	0.06	1.00
5	2159	-0.36	0.69	0.16	1.05
6	1024	-0.38	0.77	0.20	1.16
6	2249	-0.45	0.77	0.23	1.22
7	1115	-0.37	0.79	0.21	1.16
7	2340	-0.37	0.78	0.18	1.15
8	1205	-0.42	0.70	0.16	1.12
9	30	-0.25	0.90	0.31	1.14
9	1255	-0.20	0.94	0.36	1.13
10	121	-0.26	0.96	0.30	1.23
10	1346	-0.25	0.88	0.28	1.13
11	211	-0.26	0.87	0.20	1.14
11	1436	-0.37	0.79	0.13	1.15
12	301	-0.27	0.77	0.19	1.05
12	1527	-0.30	0.77	0.18	1.07
13	352	-0.22	0.75	0.20	0.97
13	1617	-0.24	0.73	0.20	0.97
14	442	-0.10	0.72	0.24	0.82
14	1707	-0.18	0.66	0.20	0.84
15	532	-0.20	0.62	0.14	0.82
15	1758	-0.16	0.57	0.16	0.73
16	623	-0.25	0.53	0.14	0.78
16	1848	0.00	0.67	0.28	0.67
17	713	-0.03	0.65	0.26	0.68
17	1938	0.02	0.85	0.35	0.84
18	804	0.22	0.84	0.53	0.62
18	2029	0.18	0.94	0.50	0.77
19	854	-0.10	0.86	0.38	0.96
19	2119	-0.12	0.85	0.34	0.97
20	944	-0.19	0.86	0.31	1.05
20	2210	-0.30	0.78	0.29	1.08
21	1035	-0.25	0.81	0.24	1.06
21	2300	-0.25	0.83	0.31	1.08
22	1125	-0.34	0.96	0.29	1.30
22	2350	-0.24	0.93	0.37	1.17
23	1216	-0.32	1.13	0.33	1.46
24	41	-0.32	1.16	0.38	1.48
24	1306	-0.28	1.25	0.43	1.53
25	131	-0.37	1.30	0.33	1.67
25	1356	-0.42	1.18	0.29	1.60
26	222	-0.40	1.15	0.33	1.55
26	1447	-0.30	1.19	0.36	1.48
27	312	-0.38	1.16	0.28	1.54
27	1537	-0.40	1.02	0.25	1.41
28	402	-0.40	1.03	0.22	1.43
28	1628	-0.27	1.01	0.27	1.29
29	453	-0.21	1.04	0.33	1.25
29	1718	-0.20	0.81	0.27	1.01
30	543	-0.31	0.81	0.19	1.12

TABLE 6
WATER LEVELS (METERS MSL)
Tidal Characteristics
April 1986

VII. NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Zeiss surveying system; a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in March and the two surveys taken during April on profile line 188, located 517 m south of the pier. A northeast storm on 18-21 April produced major profile changes during the month which included erosion of the nearshore bar (140 m). Offshore a similar pattern developed with a steep offshore bar (240 m) also disappearing and being replaced by a much flatter (200 to 460 m) storm bar.

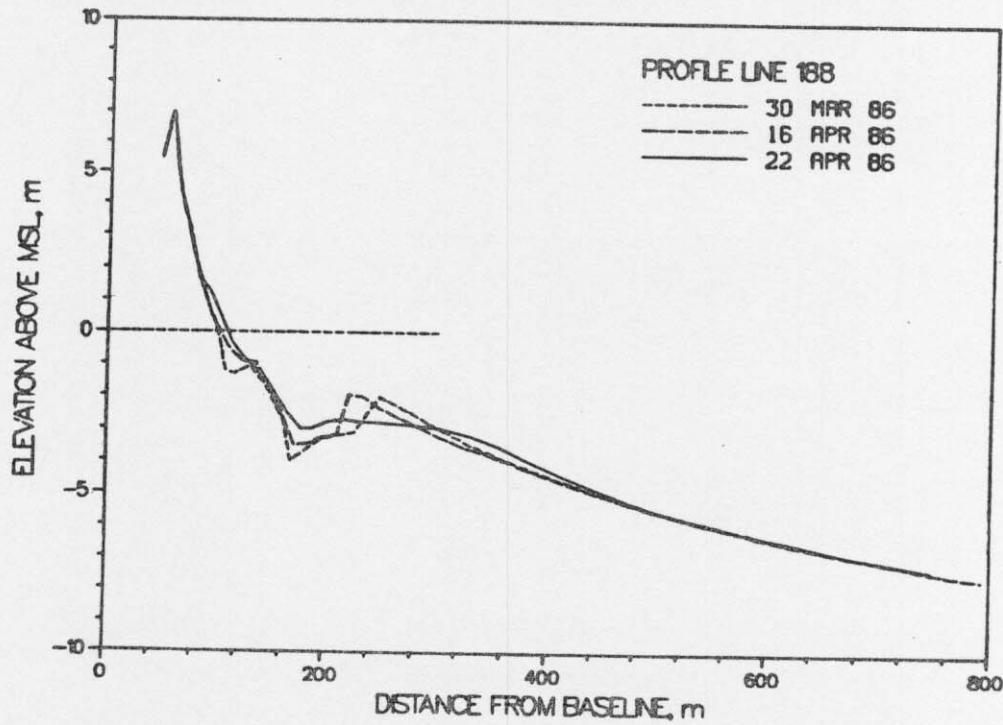


Figure 5. Monthly CRAB profiles on profile 188 - 517 meters south of pier.

The profile envelope (Figure 6) reflects the maximum changes which occurred on the profile during April. The major change in the envelope (220 m) reflects the shoreward migration of the nearshore bar preceding the storm.

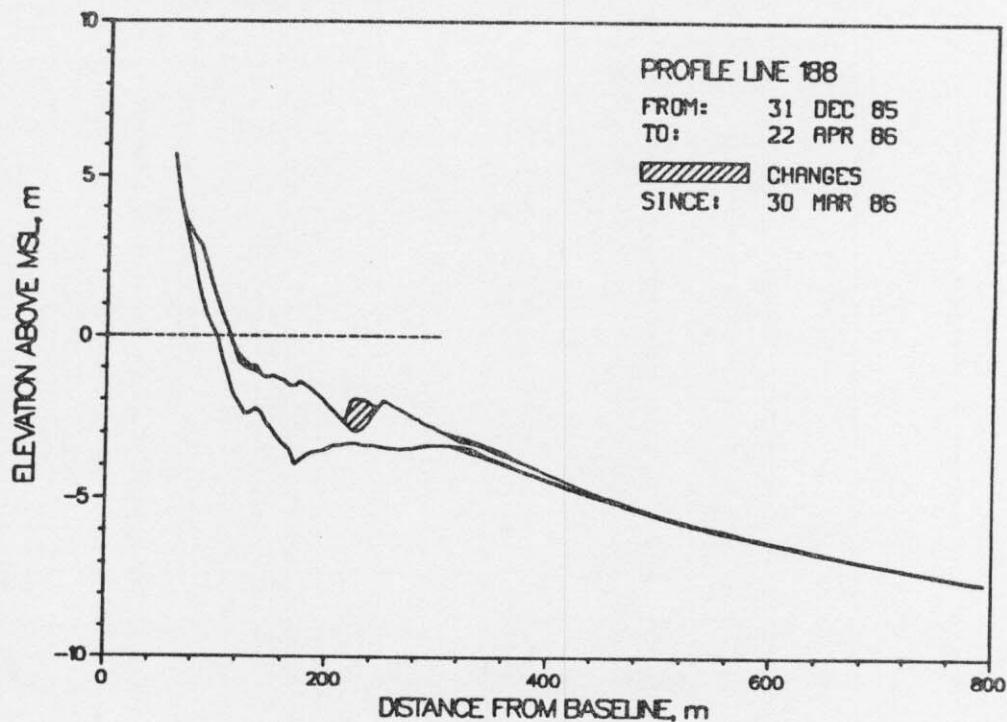


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. No bathymetric survey was conducted in April. The last survey, 28 February 1986, is included for reference.

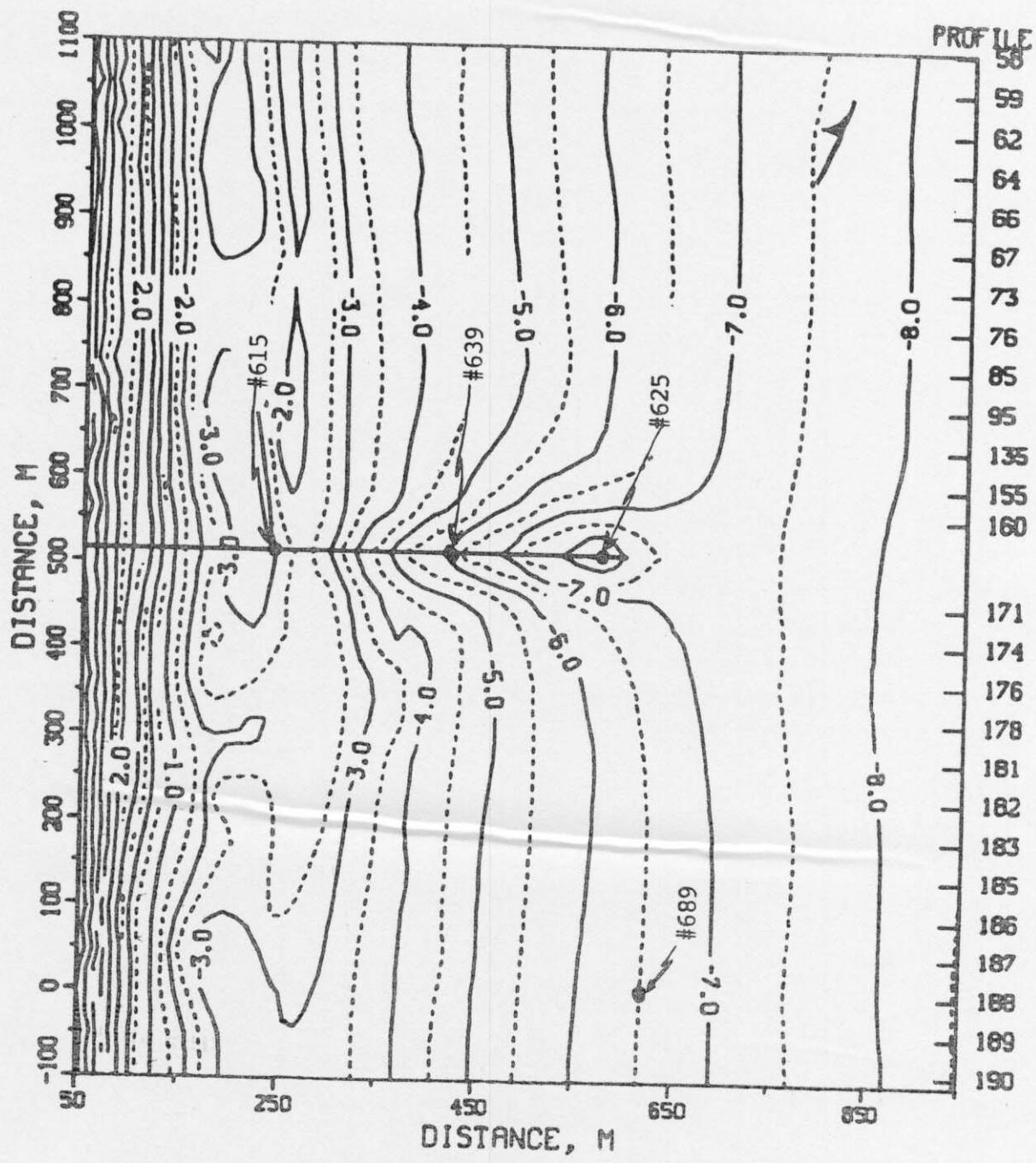


FIGURE 7. FRF BATHYMETRY 28 FEB 86
CONTOURS IN METERS

VIII. SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the wave height at the seaward end of the pier (i.e. as measured by the Baylor gage #625 at pier station 19+00) exceeded 2 m and wave records were obtained every hour:

<u>Start</u>	<u>End</u>
18 April (1100)	21 April (0200)

B. Storm Synopsis.

18-21 April 1986 - Developing over Chesapeake Bay early on 16 April, this storm slowly moved to the east reaching maximum strength on 19 April while located well offshore. Peak sustained winds at the FRF approached 17 m/s and the maximum Hmo (gage #625) of 3.17 m was recorded at 1700 hours on the 19th. The lowest barometric pressure reading was 1004 mb at 1300 hours on the 16th. Total precipitation was 19 mm.

Distribution List

Government Agencies:

OCE
BERH
NAO
NASA/Wallops Flight Center
NOAA (NOS, NWS)
SAD
SAW

U.S. Geological Survey
U.S. National Park Service
U.S. Naval Academy
U.S. Naval Civil Eng. Lab
U.S. Naval Fac. Eng. Com.
U.S. Naval Research Lab

Colleges/Universities:

California Inst. of Tech.
Duke University
East Carolina University
Florida Inst. of Tech.
NC State University
Old Dominion University
Oregon State University
Prince George's College
Rutgers University
Scripps Inst. of Oceanography
Southern Illinois University

Stockton State College
Texas A&M University
University of Akron
University of Delaware
University of Florida
University of Maryland
University of Miami
University of North Carolina
University of N. Colorado
University of Rhode Island
University of Virginia
Va. Inst. of Marine Science

Others:

City of Va. Beach, VA
Coastal Barge Corporation
Coastal and Est. Res., Inc.
Coastal Science & Eng., Inc.
Dr. Galvin
GEOMET, Inc.
Greenhorne & O'Mara, Inc.
Dr. Hylton
Ms. Johnson
Mary Marr, Inc.
Masonite Corporation

Moffatt & Nichol, Eng.
Offshore Coastal Technologies
Mr. Rowland
Mr. Savage
Sea Port Supply Corp.
Shell Development
Sohio Petroleum Co.
So. CA Coast. Water Res. Pro.
Mr. & Mrs. Valpey
WCTI-TV

Foreign:

W. F. Baird & Asso. Coastal Engineers, Ltd (Canada)
Ministry of Construction, Coastal Division (Japan)
Norwegian Hydrodynamic Laboratories (Norway)
University of New South Wales (Australia)
University of Sydney (Australia)